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Understory Vegetation Inventory: An Efficient Procedure

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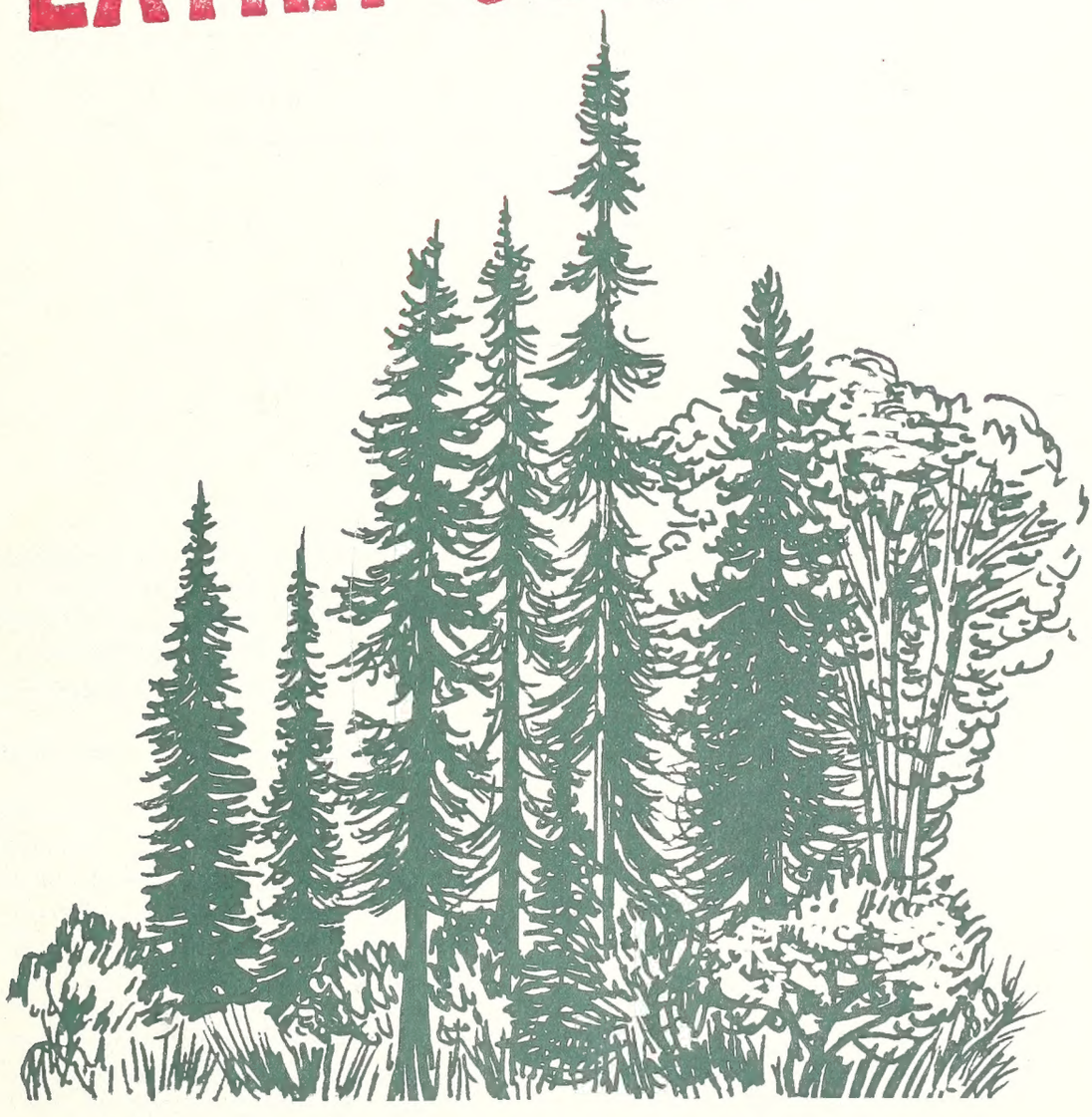

THE AUTHORS

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RESEARCH SUMMARY

The Understory Vegetation Inventory Procedure used on Forest Survey plots provides some basic information about the plant community that, when combined with other information, can be used for wildlife habitat and forage evaluation, grazing use potential, potential climax and seral stage of vegetation, and estimation of land productivity in terms of biomass.

Understory Vegetation Inventory: An Efficient Procedure

Renee O'Brien
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INTRODUCTION

To meet the requirements for national assessments mandated by the Forest and Rangeland Renewable Resources Planning Act of 1974 and other legislation, the USDA Forest Service's Forest Survey has expanded traditionally timber-oriented inventories to include data on understory vegetation. Such information, in combination with overstory data, provides a structural picture of the plant community that can be used in many disciplines with broad application for wildlife habitat and forage evaluation, grazing use potential, and estimation of land productivity in terms of biomass.

Several schemes for sampling understory vegetation provide useful information (Cost 1979; Pearson and Sternitzke 1974; USDA Forest Service 1980, 1981a, 1982a). Each has been developed in relation to the vegetational characteristics peculiar to a general geographic location, attendant wildlife species, land use patterns, and according to the needs and demands of data users. To be suitable for use by Forest Survey, a procedure should:

1. Be adaptable to an extensive, sample-based inventory.
2. Be easily integrated into the existing physical procedures and time frame of Forest Survey.
3. Consist of objective observations that personnel with limited taxonomic skills can perform.
4. Be applicable throughout the field season (April through October).
5. Cause no disturbance to vegetation on permanent plots.

The procedure presented here was developed for use in the Rocky Mountains (fig. 1) by Forest Survey at the Intermountain Forest and Range Experiment Station. It is an adaptation of several established methods.

Forest Survey conducts an extensive inventory that provides data for RPA assessments, national level decisionmaking, and State level analysis of the resource situation. The extensive nature of the inventory lends itself to a brief and simple estimate of the characteristics of the vegetation. In the Intermountain area, a list of major species of a site and an estimate of composition and vertical diversity provides the basic structural picture needed for general biomass, wildlife habitat, and range interpretations.

PROCEDURE

The Understory Vegetation Inventory Procedure was used in the 1981 inventory of State and private lands in Idaho, in 1982 in a similar inventory of Colorado, and in 1983 in the South Dakota and Wyoming inventories. The procedure proved efficient and satisfactory in providing some basic information about the plant community at each field location sampled by Forest Survey crews. Such information is sufficient for most general understory vegetation interpretations.

Made up of two parts, the Understory Vegetation Inventory uses a 1/20-acre circular plot surrounding each of the five cluster sample points used for the timber inventory. A more complete explanation of this procedure can be found in the Forest Survey field manuals (USDA Forest Service 1981b, 1982b, 1983a, b).

Part I provides **individual species** information. For each of the four plant groups—trees, shrubs, forbs, and graminoids—up to four species occurring with a crown canopy cover of at least 5 percent are recorded. Crown canopy cover is the area of ground surface covered by the canopy of a plant. Canopy coverage for each species recorded is visually estimated and assigned one of the following coverage classes (Daubenmire 1959):

Crown canopy cover class codes	Percent crown canopy coverage
1	5
2	6- 25
3	26- 50
4	51- 75
5	76- 95
6	96-100

Rarely do more than four species occur for any one plant group with 5 percent crown canopy cover or greater. The 5 percent canopy cover stipulation reduces the number of plant species requiring identification by field crews. A crown canopy cover class is assigned each species recorded. Part I provides an indication of the major species composition and horizontal diversity of a plot.

ROCKY MOUNTAIN STATES

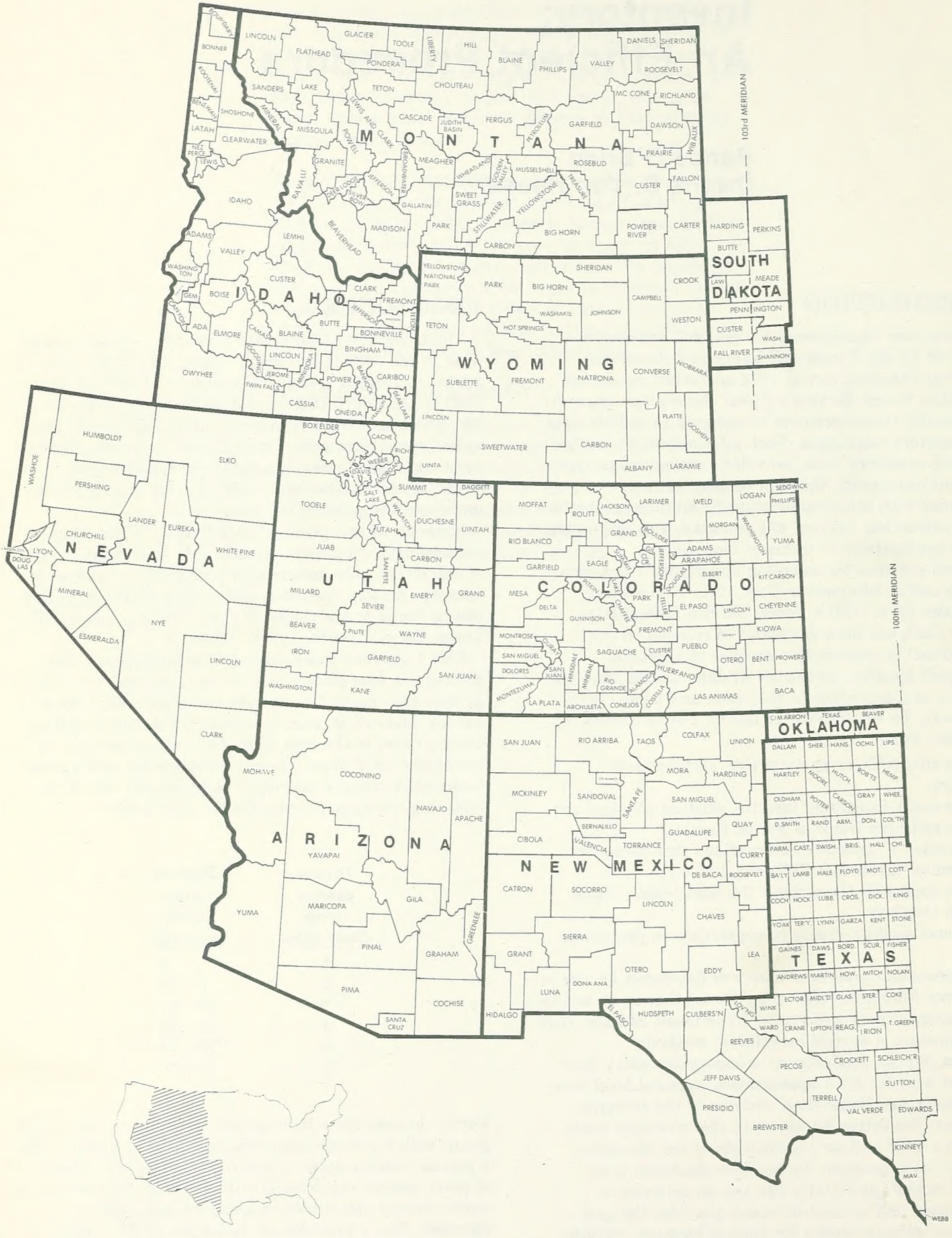

Figure 1.—Map of area inventoried by Forest Survey.

The vertical diversity of vegetation on a plot is described by the assignment of one of three vegetational layers to each species recorded:

Layer 1 – (0-1.5 ft)
Layer 2 – (1.6-6 ft)
Layer 3 – (6.1+ ft)

Confining the species list to only the predominantly occurring plants makes the procedure fast and easy and still provides a picture of the basic composition of the understory vegetation.

Part II provides **plant group** information that, when combined with the overstory tree data, will provide a vegetational profile of the plot. Part II entails an assessment of the plant groups on the plot by layer. For each of the three layers previously referred to, a cover class is assigned to any of the four plant groups that occurs on the plot. This characterization by plant group provides a slightly different picture than the species list from Part I, and includes plants not abundant enough to be recorded by species, but which contribute to the vegetational structure when grouped.

DISCUSSION

Information collected with the Understory Vegetation Inventory Procedure, when combined with the overstory data taken on Forest Survey plots, will provide a structural profile of the plant community for each location. This profile can be interpreted in many ways for use in various disciplines.

For example, the data may be used to obtain estimates of area of wildlife habitat. Computer programs are available at this time such as WILD RAM (Winn and others n.d.) used by Forest Service Intermountain Region and WFHR (Prather and Burbridge n.d.) used by Forest Service Northern Region. These programs use general timber stand variables such as forest type, size class, age, canopy cover, and other stand features, to predict potential wildlife use of a site for feeding, breeding, or resting. More specific types of designations could be made using the understory structure and composition information provided by inventory data. Correlations of animal species with timber site capacity and animal species diversity with stand condition may also be developed.

The understory vegetation information combined with habitat type designations such as those presented by Pfister (1976) would give an indication of the potential climax vegetation and seral stage of the plant community. This information would be useful for many range, wildlife, and silvicultural interpretations.

The data may also be useful in conversion to estimates of biomass. Some biomass conversion factors or equations have been developed using cover and height information of either plant groups or individual species (Brown and Marsden 1976; Alexander 1978; Olson and Martin 1981). For range managers, the data can provide a list of preferred forage species present or relative amounts of herbaceous or browse materials available. Such information should be useful in evaluating the effects of various resource interactions.

EXAMPLE

An illustration of the vegetation occurring on one five-point location cluster (fig. 2) would have a corresponding entry such as the example in figure 3. One way of summarizing the combined overstory and understory data of a location is the vegetation profile (fig. 4). This profile plots height of vegetation over percent canopy cover of the four different plant classes—trees, shrubs, forbs, and graminoids.

Several observations can be made about the vegetational structure of this plot. The plot has extensive grass/forb cover that could make it a feeding area for deer and elk. The presence of the forb *Arnica cordifolia*, which is preferred by elk (USDA Soil Conservation Service 1982), makes this type of condition more favorable for use by elk. This condition would not be preferred for hiding cover for deer and elk because of the inadequate tree and shrub cover between 2 and 6 feet. Thermal cover requirements for elk and deer are not met because the overstory canopy cover does not exceed 70 percent (USDA Forest Service 1979). Thus, this condition would probably be used by deer and elk only for transitory feeding.

The structural diversity of the vegetation on this plot—grass/forb, shrub, seedling, and multistoried canopy layers all present—indicates that the area could be used by many species of birds. The bird population could include insect gleaners feeding in the tree and shrub layers and on the ground, and species that breed in dense low tree and high shrub canopies. The high amount of herbaceous cover on the plot indicates that forage is available for domestic animals although none of the species listed are preferred by livestock (USDA Soil Conservation Service 1982).

The vegetational information of a plot is not meant to stand alone. Usually the profiles are developed for a group of field locations that meet specific criteria. In addition, the vegetation profile is meant to be used with other data collected such as elevation, slope, aspect, size of condition, nearness to roads, nearness to water, and snags and other special features for wildlife, which are important but are not within the scope of this paper.

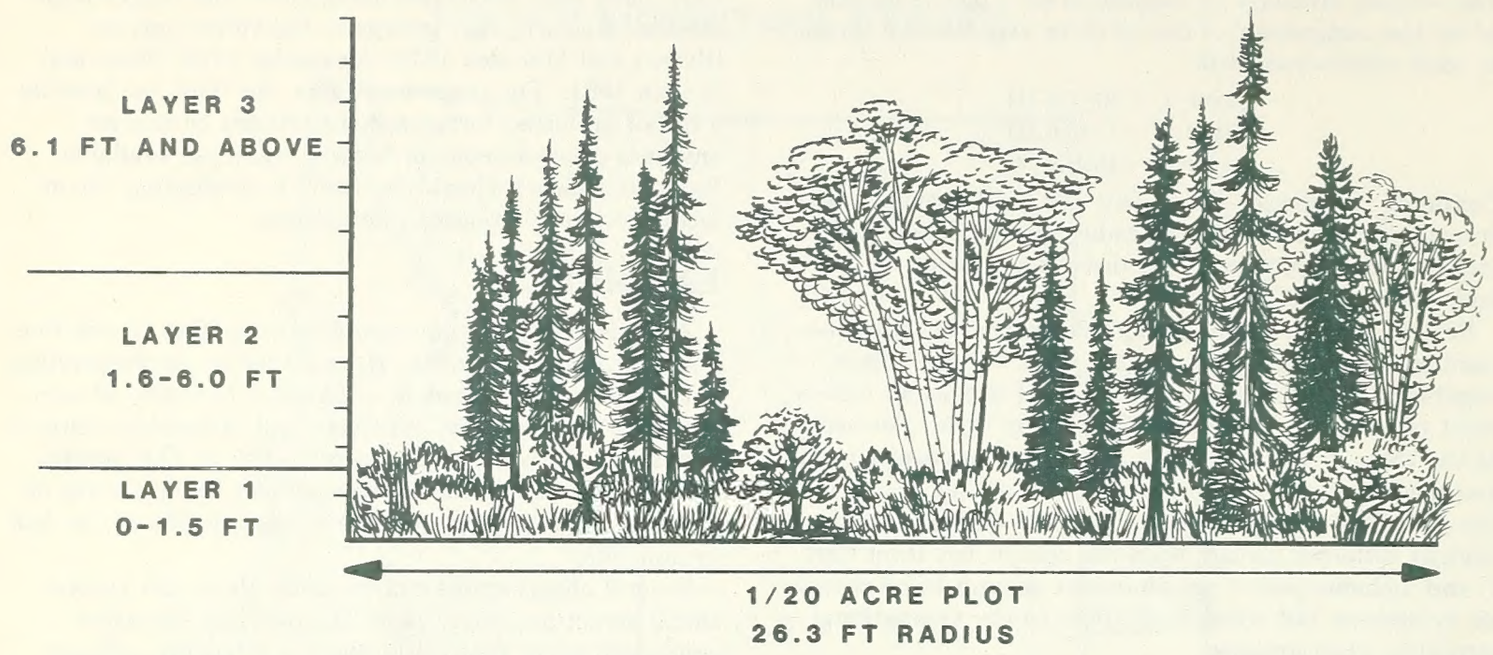

Figure 2.—Illustration of the understory vegetation on one point of the five-point cluster.

POINT NUMBER	PART 1 - SPECIES LIST BY COVER CLASS AND LAYER												PART 2 - PLANT GROUP COVER CLASS BY LAYER				
	TREES			SHRUBS			FORBS			GRAMINOIDS			Layer	TREES	SHRUBS	FORBS	GRAMINOIDS
	Species	Cover	Layer	Species	Cover	Layer	Species	Cover	Layer	Species	Cover	Layer					
	XXXXX	X	X	XXXXX	X	X	XXXXX	X	X	XXXXX	X	X		X	X	X	X
1	ABGR	3	3	VAME	3	2	GATR	2	1	CARU	4	1	3 (6.1' +)	4	2	0	0
	PSME	1	3	ALSI	2	3	VIOR	3	1				2 (1.6-6')	1	3	0	0
	LAOC	2	2				ARCO	2	1				1 (0-1.5')	0	0	4	4
							SMRA	2	1								

LAOC – Larix occidentalis
ABGR – Abies grandis
ALSI – Alnus sinuata
PSME – Pseudotsuga menziesii
VAME – Vaccinium membranaceum
GATR – Galium triflorum
CARU – Calamagrostis rubescens
ARCO – Arnica cordifolia
VIOR – Viola orbiculata
SMRA – Smilacina racemosa

Figure 3.—Example of the field data form entry for the vegetation on the plot illustrated above.

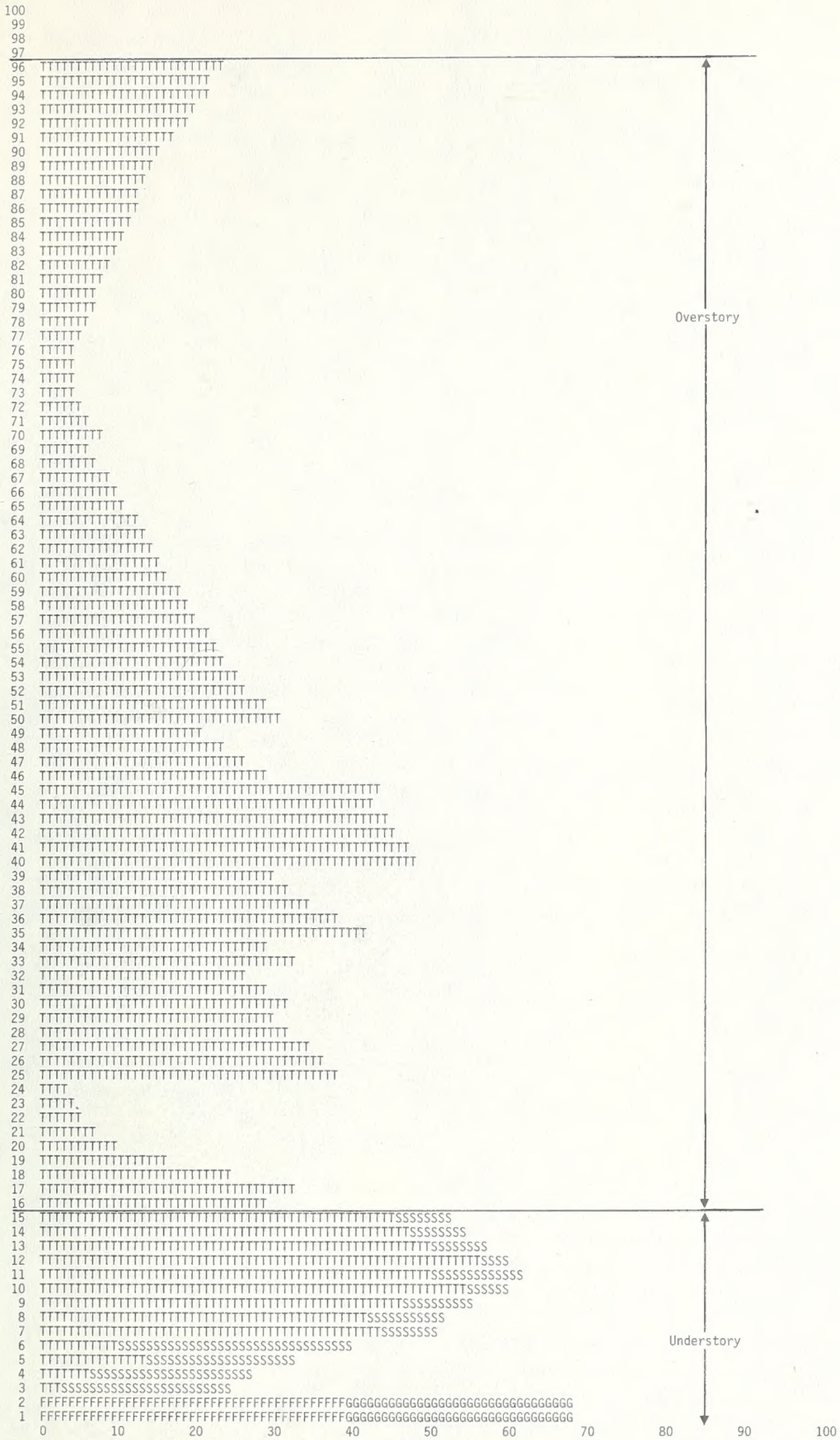

Figure 4.—Vegetational profile.

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O'Brien, Renee; Van Hooser, Dwane D. Understory vegetation inventory: an efficient procedure. Research Paper INT-323. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1983. 6 p.

Presents a procedure for describing understory vegetation on forested plots. Plant species with 5 percent or greater canopy cover are listed and assigned a canopy cover class and a height layer class. Each of the four plant groups—trees, shrubs, forbs, and graminoids—are assigned a canopy cover class by layer. These data are to be combined with tree canopy and other stand data for use in range, wildlife, biomass, and silvicultural interpretations.

KEYWORDS: understory vegetation inventory, Forest Survey techniques, vegetational structure, canopy cover, plant groups